

Where do bees build their nests?

The influence of land use history and microhabitat on nest presence of solitary, ground-nesting bees

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INTRODUCTION:

1. Tallgrass prairie is the most threatened and least protected habitat in the world (Hoekstra et al., 2005).
2. Bees are experiencing striking declines due to anthropogenic disturbances (Potts et al., 2010).
3. Approximately 80% of native bees are solitary, ground-nesting bees (O'Toole & Raw, 1991).
4. In Kansas, bees tend to nest in bare ground, sandy and well-drained soils, and south-facing slopes (Cane, 1991).
5. The tallgrass prairie comprises land with varying histories, like remnant prairie, restorations, and old fields

METHODS:

- Trap in West-Central Minnesota
- Pick 8 locations, each with 3 land types = 24 sites
- Locate randomized GPS points at each site
- Trap bees using emergence tents (Bugdorm, Megaview Science Co. Ltd, Taiwan)
- Move traps 1,440 times throughout the summer
- Measure soil and vegetation characteristics at 313 trap locations

RESULTS:

Count of bees by location and land use history

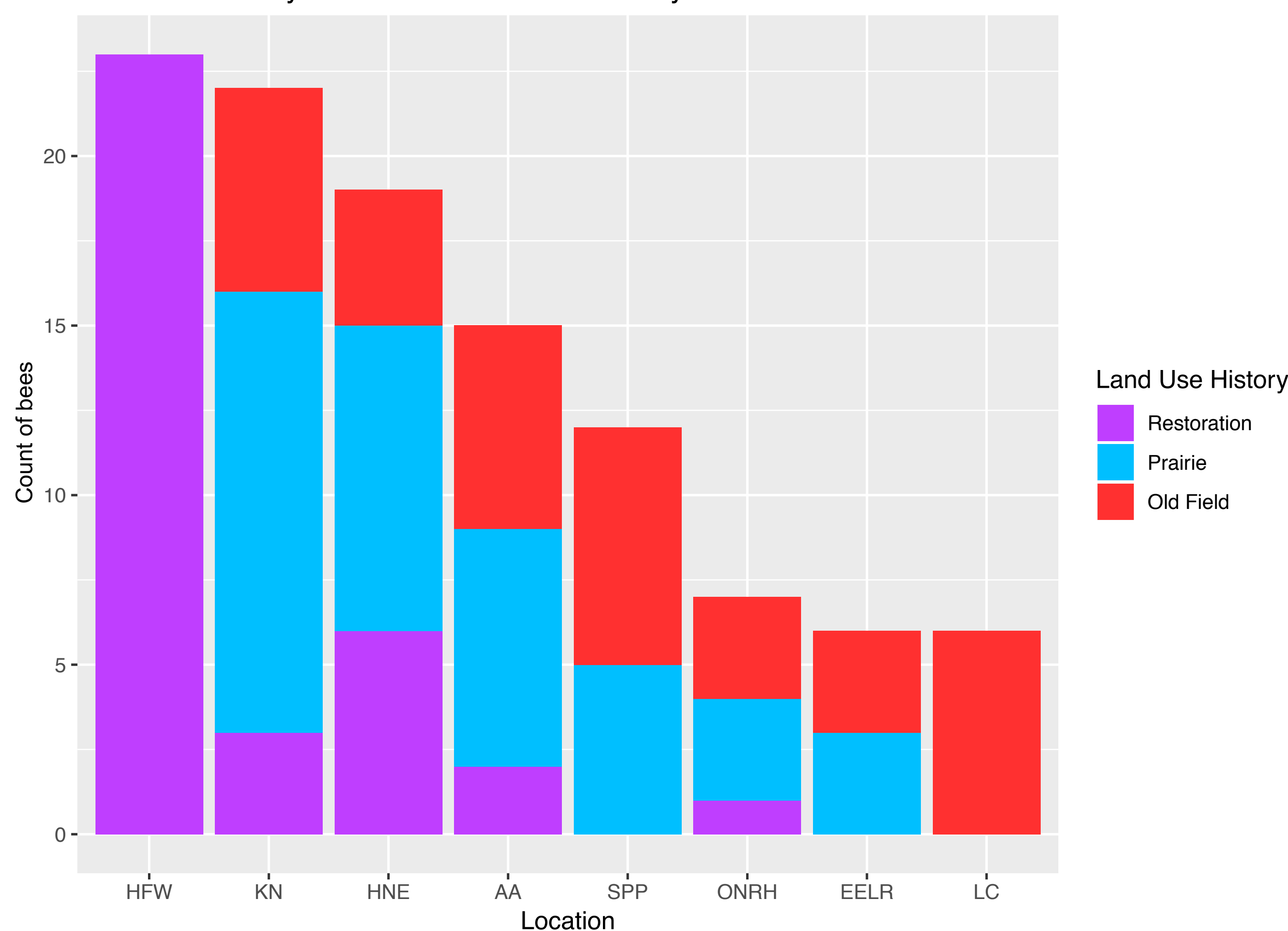


Fig. 1. I captured a total of 110 bees, in 74 traps. Land use history does not predict bee nest presence according to a GLM with binomial response ($n = 1440$, $p = 0.6$). Land use and location interact in their effect on bee presence or absence according to a GLM with a binomial response ($n = 1440$, $p < 0.0001$).

Solitary, ground-nesting bees nest in remnant prairies, restorations, and old fields.

These bees nest where bare ground is abundant, on southwest facing slopes, the soil is sandy and silty, where vegetation is diverse, plants are short, and there is little plant duff.

Nest building variables

- Bare ground ($p < 0.001$)
- Slope ($p < 0.001$)
- Percent sand ($p < 0.001$)
- Percent silt ($p < 0.001$)
- Abundance litter / duff ($p < 0.001$)
- Abundance grass ($p < 0.001$)
- Duff height ($p < 0.001$)
- Vegetation height ($p < 0.01$)
- North aspect ($p < 0.001$)
- East aspect ($p < 0.001$)
- Simpson's ($p < 0.001$)
- Shannon's ($p < 0.001$)
- Richness ($p < 0.001$)
- Shade ($p > 0.1$)
- Soil hardness ($p > 0.1$)

Table 1. All microhabitat variables measured in a subset of sampled traps ($n=313$) and their corresponding p-values.

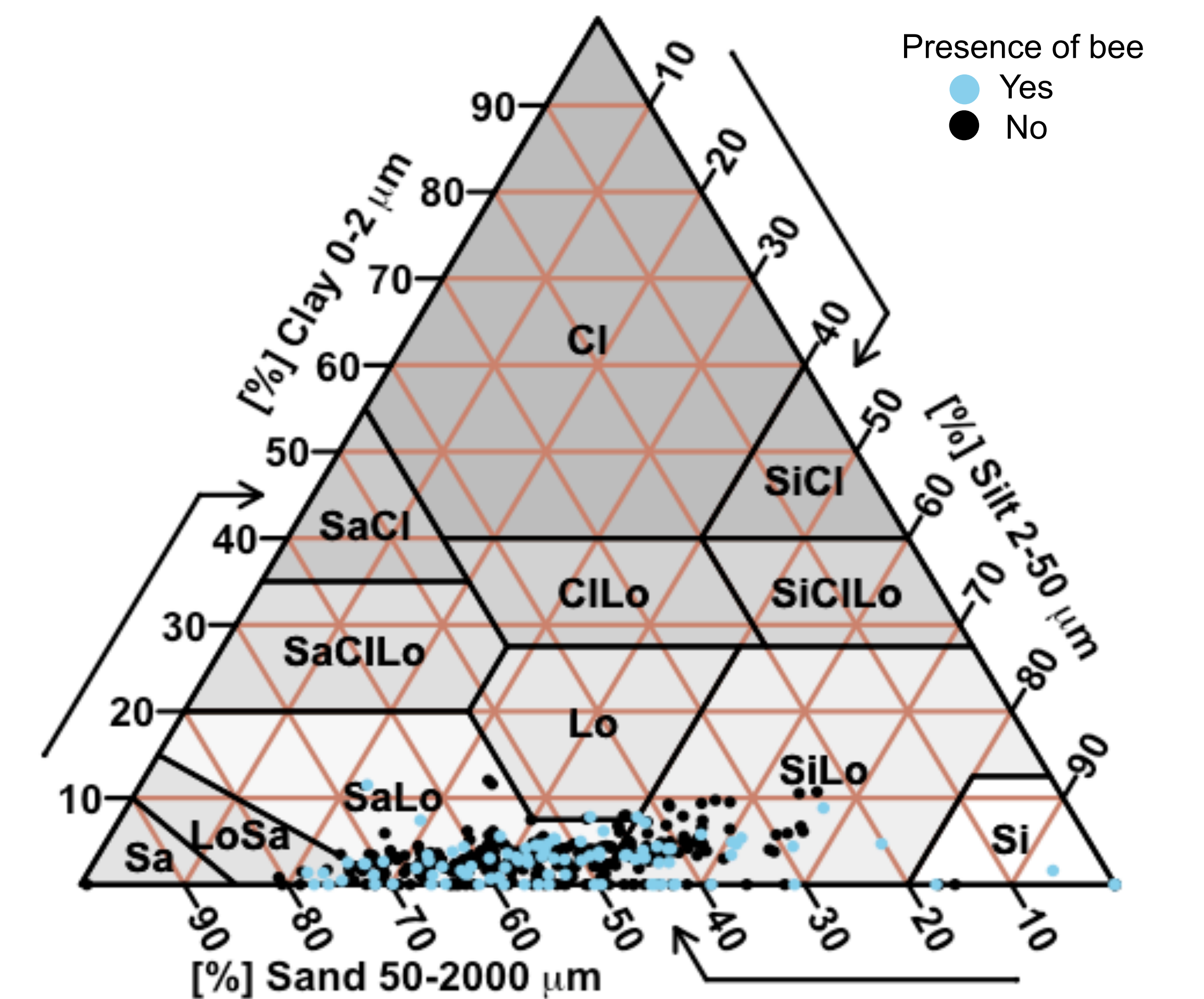


Fig. 2. Plot of all sampled bee nests and corresponding soil texture values ($n=385$). Figure was generated from package 'soilttexture' in R Version (3.5.2). Most traps with bees were found in loamy sand, sandy loam, or silty loam soil.

DISCUSSION:

- Numerous variables interact to determine nest presence
- Nest density is low and does not differ between remnant prairies, restorations, and old fields

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the echinacea project



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